



Special Issue - Innovative Commerce: Bridging Business and Computer Applications (ICBBCA-2026)
PG Department of Commerce with Computer Applications, Mannar Thirumalai Naicker College, Madurai - March 2026

MACHINE LEARNING APPROACHES FOR RELIABLE CROP YIELD FORECASTING

Mrs.T.Sudhamathi

*Assistant Professor,
Department of Commerce(IT),
Mannar Thirumalai Naicker College,
Madurai, Tamil Nadu, India.*

Mr.V.J.Freedy Blesson

*Assistant Professor,
PG Department of Commerce with Computer
Applications,
Mannar Thirumalai Naicker College,
Madurai, Tamil Nadu, India.*

Abstract

Agriculture plays an important role in ensuring food security and economic development. Predicting crop yield accurately helps farmers and policymakers make better decisions related to crop planning and resource management. Traditional prediction methods are often based on historical averages and may not capture complex environmental relationships. This study focuses on predicting crop yield using machine learning techniques based on parameters such as rainfall, temperature, soil type, and humidity. Machine learning algorithms such as Linear Regression, Decision Tree, and Random Forest are used to analyze agricultural data and generate yield predictions. The results show that machine learning models can improve prediction accuracy and support better agricultural decision-making.

Keywords: Crop Yield Prediction, Machine Learning, Agriculture Data Analysis, Random Forest, Decision Tree, Linear Regression, Smart Agriculture.

Introduction

Production is influenced by factors such as soil quality, rainfall, temperature, and farming practices. Due to changing climate conditions, predicting crop yield has become more challenging for farmers. Traditional crop yield prediction methods rely on historical records and manual estimation, which may not provide accurate results. With the development of data science and machine learning, it is possible to analyze large agricultural datasets and identify patterns that influence crop productivity. Machine learning algorithms can process multiple variables and generate more accurate predictions. This study explores the use of machine learning



Special Issue - Innovative Commerce: Bridging Business and Computer Applications (ICBBCA-2026)

PG Department of Commerce with Computer Applications, Mannar Thirumalai Naicker College, Madurai – March 2026

techniques to predict crop yield using environmental and agricultural data.

The findings of this research can help improve decision-making in agriculture and support sustainable farming practices.

Review of Literature

- Previous research shows that machine learning techniques can be used to improve crop yield prediction by analyzing agricultural and environmental data.
- Some studies used algorithms such as **Linear Regression** and **Decision Tree** to predict crop yield based on factors like rainfall, soil type, and temperature.
- Researchers have also applied **Random Forest models**, which combine multiple decision trees to improve prediction accuracy and reduce errors.
- Recent research suggests that machine learning models can help farmers make better decisions about crop planning and resource management.
- These studies show that data-driven approaches can improve agricultural productivity and support modern farming practices.

Methodology

Data Collection

The dataset used in this research includes several agricultural and environmental parameters that influence crop

productivity. The data may be collected from agricultural databases, government agricultural reports, and weather monitoring systems.

The Dataset Contains Information such as:

- Crop Type
- Soil Type
- Rainfall
- Temperature
- Humidity
- Cultivated Land Area
- Historical Crop Yield

These parameters are used as input variables for the crop yield prediction model.

Data Preprocessing

Data preprocessing is an important step in machine learning because raw agricultural data may contain missing values, noise, or inconsistent entries.

The Following Preprocessing Techniques are Applied:

- Data Cleaning to Remove Incomplete Records
- Handling Missing Values
- Data Normalization
- Feature Selection

These steps improve data quality and help the machine learning models perform more accurately.



Special Issue - Innovative Commerce: Bridging Business and Computer Applications (ICBBCA-2026)

PG Department of Commerce with Computer Applications, Mannar Thirumalai Naicker College, Madurai – March 2026

Machine Learning Models

Several machine learning algorithms are used to train the crop yield prediction system.

Linear Regression

Linear Regression is used to analyze the relationship between independent variables such as rainfall and temperature and the dependent variable (crop yield).

Decision Tree

Decision Tree is a supervised learning algorithm that divides the dataset into branches based on decision rules. It is easy to interpret and works well with structured agricultural data.

Random Forest

Random Forest is an ensemble learning technique that combines multiple decision trees to improve prediction accuracy and reduce overfitting. It is widely used for agricultural prediction tasks.

Conclusion

Crop yield prediction is an important aspect of agricultural management and food security. Traditional prediction methods often fail to consider the complex relationships between environmental and agricultural factors. This study presented a machine learning-based approach for predicting crop yield using parameters such as rainfall,

temperature, soil type, and cultivated land area.

Several machine learning algorithms were applied to analyze agricultural data and generate yield predictions. Among the tested algorithms, Random Forest produced the most accurate results due to its ability to handle nonlinear relationships and large datasets.

The findings demonstrate that machine learning techniques can significantly improve crop yield prediction and support data-driven agricultural decision-making. Future research can further improve crop yield prediction systems by incorporating advanced technologies and larger datasets.

References

1. R. Medar, V. Rajpurohit, and S. Shweta, "Crop Yield Prediction Using Machine Learning Techniques," *International Journal of Computer Applications*, 2016.
2. N. Chandrasena Reddy et al., "Crop Yield Prediction Using Machine Learning," *International Journal of Engineering Research & Technology*, 2023.
3. S. Jeong et al., "Random Forests for Global and Regional Crop Yield Predictions," *PLOS ONE*, 2016.
4. K. Shankar and S. Kumar, "Machine Learning Approaches for Agricultural Yield Prediction," *Journal of Agricultural Informatics*, 2019.



Special Issue - Innovative Commerce: Bridging Business and Computer Applications (ICBBCA-2026)
PG Department of Commerce with Computer Applications, Mannar Thirumalai Naicker College, Madurai - March 2026

5. J. Liakos et al., "Machine Learning in Agriculture: A Review," *Sensors Journal*, 2018.